Test Notes

factor by grouping

- break problem into two pieces & see what divides out of each one

ex $8r^3 - 64r^2 + r - 8$

$8r^2(r-8) + 1(r-8)$

only 1 in common

$(8r^2+1)(r-8)$

front pieces, matching

find roots given the factors

- set each piece equal to zero & solve.

ex $y = (x-2)^2(3x-1)^3(x)$

$x-2=0$ $\quad 3x-1=0$ $\quad x=0$

$x=2$ $\quad x=1/3$

* always check, have you factored completely?

roots → factor → eq.

- if given a root (ex. $x=8$) the factor would be $x-8$
  or ex. root is -5, the factor would be $x+5$
- write all the factors in, plug in a point & solve for a

* given a graph, similar idea only you look at the zeros then change them into factors, plug in a point & solve for a.

The general formula for factored form is...

$$f(x) = a(x-p)(x-g)(x-r)(x-w)\ldots$$

end behavior

LC + D even — up-up

LC + D odd — down-up

LC − D even — down-down

LC − D odd — up-down

roots/zeros from multiplicity

- if the degree is 1 then it's a single root ex. $(x-3)^1$
- if the degree is 2 then it's a double root (bounces) ex. $(x-3)^2$
- if the degree is 3 then it's a switchback root ex. $(x-3)^3$

Vocab

- leading coefficient (LC) is the # attached to the highest degree
- degree (D) is the biggest exponent
  - *given factored form, you add the exponents together

examples

1. $-9x^3 + 10x^2 - 14x^5 + 9 \longrightarrow$ LC: -14, D: 5

2. $4(x-1)^2(x+3)(3x-5)(x+6)^3 \longrightarrow$ LC: 12 (all #s with x), D: 7 (add exponents)

dividing

- focus on front terms
- remainder is written R/divider
- if the remainder is zero then it's a factor
- don't forget place holders

ex

$(3x^3-5x^2+10x-3) \div (3x+1) = x^2-2x+4 - \frac{7}{3x+1}$

$$
\begin{array}{r|l}
3x+1 & x^2-2x+4 \\
\hline
3x^3-5x^2+10x-3 & \\
-(3x^3+x^2) & \\
\hline
-6x^2+10x & \\
-(-6x^2-2x) & \\
\hline
12x-3 & \\
-(12x+4) & \\
\hline
-7 &
\end{array}
$$

① what times $3x$ gives me $3x^3$? $\rightarrow x^2$, goes on top

② multiply x^2 by the outside piece $(3x+1)$

③ put in a subtraction sign

④ drop down the next term

$3x+1$ is not a factor because theres a remainder

fractions

- adding/subtracting find common demonitator then combine the top
- multiplying you multiply straight across
- divide, flip the second fraction & multiply

Binomial Expansion

- use pascal's Δ to get coefficients →

	rows
1	0
1 1	1
1 2 1	2
1 3 3 1	3
1 4 6 4 1	4
1 5 10 10 5 1	5

- ID your a & b values, one exponent goes largest to 0 & one goes 0 to largest

ex $(a+b)^3 = 1a^3 + 3a^2b + 3ab^2 + 1b^3$

a goes 3 → 0
b goes 0 → 3
use row 3 for the coefficients

examples

1. $(x+3)^3 = 1x^3 + 3x^2(3) + 3(x)(3)^2 + 1(3)^3$
$= x^3 + 9x^2 + 27x + 81$

a = x
b = 3
row 3 (1, 3, 3, 1)

2. $(2x+1)^4 = (2x)^4 + 4(2x)^3(1) + 6(2x)^2(1)^2 + 4(2x)^1(1)^3 + 1(1)^4$
$= 16x^4 + 32x^3 + 24x^2 + 8x + 1$

a = 2x
b = 1
row 4 (1, 4, 6, 4, 1)